Notice of Allowability	Application No.	Applicant(s)	
	10/768,804	RUBIN ET AL.	
	Examiner	Art Unit	
	Phillip H. Nguyen	2191	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *3/4/2009*.

2. ☒ The allowed claim(s) is/are *1-21*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 20090304
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date *20090605* .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

DETAILED ACTION

1. Claims 1-21 are allowed over the prior arts of record.

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Examiner indicated to Joseph T. Cygan during a telephone interview on 6/4/2009 that claims 1, 10, and 19 are allowed over the prior arts of record in view of applicants' amendment to clarify the claimed language. However, claims 8, 16, and 21 are not in allowable condition in view of claimed language. Examiner suggested the applicant to amend claims 8, 16, and 21 to be placed in dependent form by Examiner's amendment. Authorization for this examiner's amendment was given in a telephone interview with Joseph T. Cygan (Reg. No 50,937) on 6/4/2009. Examiner's amendment is necessitated to clarify the claimed invention.

3. Claims 8, 16, and 21 have been amended below:

8. (Currently Amended) The method of claim 1 ~~A method comprising:~~

~~hashing an operation code and corresponding value numbers to generate a first hash value;~~

~~retrieving an operation value number from a first hash table based on the first hash value wherein said operation value number corresponds to components contained by a superword register; generating a result value number based on a previous value number and the operation value number wherein said result value number is a combination of operation value numbers; and determining if an instruction is redundant by searching a second hash table using the result value number~~ wherein; the instruction further includes a write mask; and wherein

generating the result value number includes, for each component in the write mask:

if the write mask value is false, setting the result value number equal to the operation value number; and

if the write mask value is true, setting the result value number equal to the previous value number.

16. (Currently Amended) The apparatus of claim 10 ~~An apparatus for superword register value numbering, the apparatus comprising:~~

~~at least one memory device storing a plurality of executable instructions; and~~

~~at least one processor operably coupled to the at least one memory device, operative to receive the plurality of executable instructions such that the processor, in response to the executable instructions and for an instruction having an operation code and value numbers of a plurality of sources:~~

~~hashes an operation code and corresponding value numbers to generate a first hash value; retrieves an operation value number from a first hash table based on the first hash value wherein said operation value number corresponds to components contained by a superword register;~~

~~generates a result value number based on a previous value number and the operation value number wherein said result value number is a combination of operation value numbers; and determines if the instruction is redundant by searching a second hash table using the result value number~~ wherein: the instruction further includes a write mask; and wherein when the at least one processor generates the result value number, the at least one processor further in response to the executable, and for each component in a write mask:

sets the result value number equal to the operation value number if the write mask value is false; and

sets the result value number equal to the previous value number if the write mask value is true.

21. (Currently Amended) The method of claim 19 ~~A method comprising:~~

~~hashing an operation code and corresponding value numbers to generate a first hash value;~~

~~comparing the first hash value with a first hash table;~~

~~retrieving an operation value number from the first hash table;~~

~~retrieving a previous value number;~~

~~generating a result value number based on the previous value number and the operation value number wherein said result value number is a combination of operation value numbers;~~

~~searching a second hash table using the result value number;~~

~~if the result value number is found within the second hash table, retrieving an output of an instruction from the second hash table; and~~

~~if the result value number is not found within the second hash table, writing the result value number to the second hash table;~~ wherein the instruction further includes a write mask; and wherein generating the result value number includes, for each component in the write mask:

if the write mask value is false, setting the result value number equal to the operation value number; and

if the write mask value is true, setting the result value number equal to the previous value number.

Examiner's Statement of Reason(s) for Allowance

4. The following is an examiner's statement of reasons for allowance:

Ng (U.S. Patent No. 6,035,124) teaches a fast and efficient way of performing Extended Global Value Numbering to identify expressions that are candidates for redundancy removal (see col. 4:18-21). Ng further teaches a hash table is used for fast access in Extended Global Value Numbering (see col. 5:57-59).

Loren Taylor Simpson ("Value-Driven Redundancy Elimination") teaches redundancy removal by using Value Numbering technique to assign numbers to values in such a way that two values are assigned the same number if the compiler can prove they are equal. When this optimization discovers two computations that produce the same value, it can eliminate one of them (see at least the Abstract).

However, neither Ng nor Loren Taylor Simpson teaches redundancy checking for superword registers or multiple components contained in a superword register as recited in the independent claims.

Therefore, it would not have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teachings of Ng and/or Loren Taylor Simpson with other prior art(s) to obtain the claimed invention.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phillip H. Nguyen whose telephone number is (571) 270-1070. The examiner can normally be reached on Monday - Thursday 10:00 AM - 3:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wei Y. Zhen can be reached on (571) 272-3708. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

PN
6/5/2009.
/Wei Y Zhen/
Supervisory Patent Examiner, Art Unit 2191